NUMERICAL SIMULATION OF REFRACTORY MASONRY SUBJECTED TO CYCLIC TEMPERATURE LOADING

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Abstract. Refractory masonry in its application is usually exposed to chemical, thermal and mechanical loads in service. Mechanical loads develop from the thermal expansion of the refractories which is confined either by the regions of different temperature within the structure or by the boundary conditions. The aim of this work is to investigate, using numerical simulation, the factors influencing the thermomechanical behaviour of the refractory masonry and the identification of failure mechanisms arising from the cyclic high temperature loadings. Different modelling approaches are used and coupled with the most advanced constitutive models available in commercial software in order to produce thorough parametric and sensitivity studies. Investigation is specially focused on the irreversible strains at the hot face of the masonry panel, tensile failures due to reduced compressive stresses at the hot face and adverse effect of this on stability of the masonry wall. The study further helps to optimize the use of refractory materials in industrial application and extending an economic and environmental benefits to the refractory consuming industries.

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